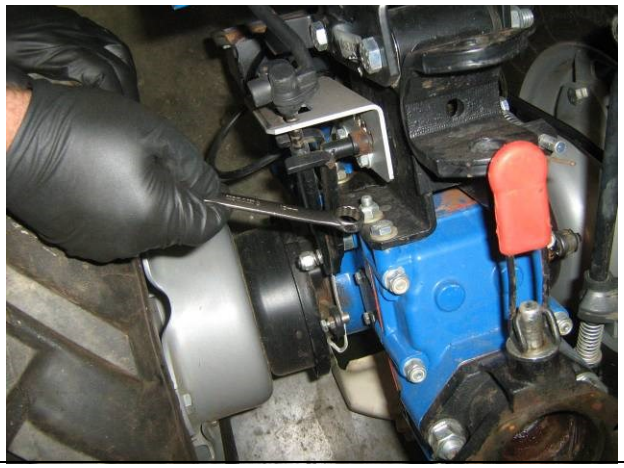
BCS TRANSMISSION PTO COVER REVOVAL & PTO SYSTEM REPAIR—1995 & NEWER TRACTORS WITH TAPER-3-JAW PTO SHAFT

STEP 1. HAVE IMPLEMENT REMOVED FROM TRACTOR, AND HAVE TRACTOR HANDLEBARS IN FRONT-PTO (MOWING) MODE FOR THIS PROCEDURE. Note: *It is recommended to look through this entire document BEFORE starting on the repair, so you can get together all the tools / materials you will need...*

2. DRAIN OIL FROM TRANSMISSION USING DRAIN BOLT LOCATED ON ENGINE SIDE OF LOWER AXLE HOUSING (14MM HEAD). LET ENGINE REST ON FLOOR—THIS IS THE BEST ANGLE TO GET THE MOST OIL OUT.

3. REMOVE COTTER PIN FROM PTO SHIFT ROD, AND REMOVE ROD FROM SHORT UP-RIGHT LEVER

4. PUT TRACTOR GEAR SELECTOR IN 1ST GEAR (MAY HAVE TO ROLL THE WHEELS A BIT TO GET IT TO SHIFT)

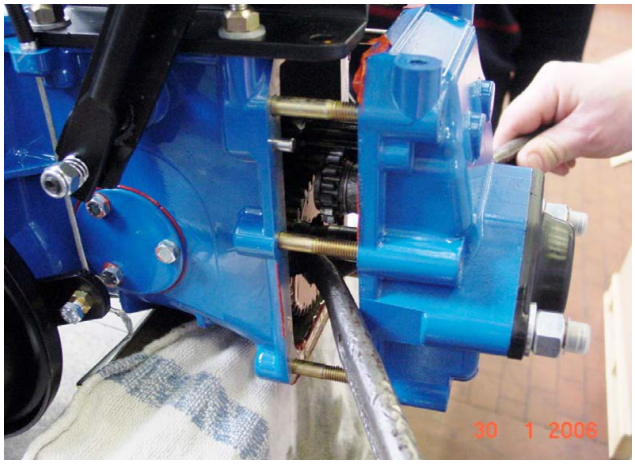


5. REMOVE TWO VERTICAL BOLTS AFFIXING HANDLEBAR SUPPORT TO TRANSMISSION PTO COVER (ONE ON EACH SIDE), THEN LOOSEN 2 NUTS IN FRONT OF THOSE BOLTS 1 TURN EACH

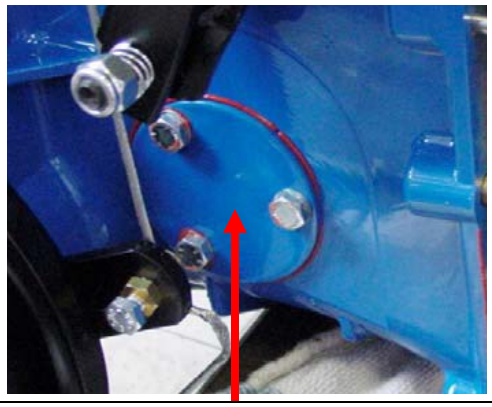
6. REMOVE 6 NUTS AND WASHERS AFFIXING PTO COVER.

7. USING A SOFT-FACED HAMMER, START TAPPING THE PTO COVER OFF, STRIKING ON THE INSIDE FLANGE OF QUICK-COUPLING (IF EQUIPPED) **AND/OR….**(SEE #8)

8. ...THE BASE OF THE PTO SHIFT LEVER. **VERY IMPORTANT NOTE:** ***IF COVER ONLY COMES OFF A LITTLE BIT (1/4" TO 1/2") AND STOPS, DO NOT FORCE IT ANY FURTHER, OR YOU WILL BREAK SOMETHING!!! GO TO NEXT STEP….***



9A. ...THIS IS THE "FIRST" WAY TO TRY TO GET THE COVER OFF: USING 2 THIN PRY-BARS, PRY AGAINST THE LARGE LOWER GEAR IN THE TRANSMISSION, PULLING BACK TO REMOVE THE COVER. IF THIS DOES NOT WORK….



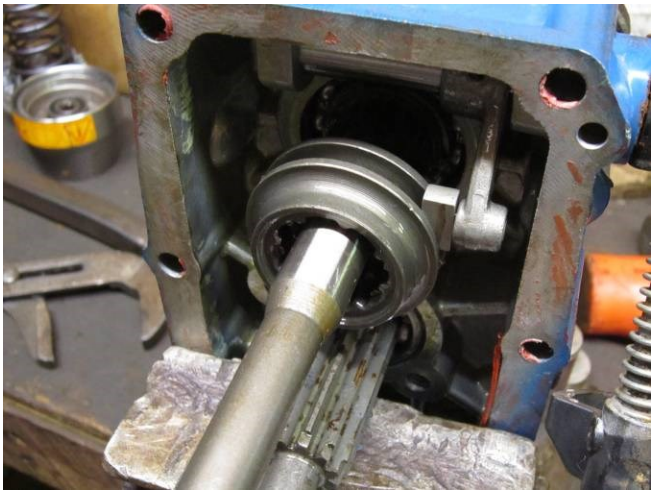
9B. ...THEN THIS ACCESS COVER MUST BE REMOVED, AND THE OFFENDING **BEARING,** WHICH WILL BE VISIBLE ON THE LEFT SIDE OF THE ACCESS HOLE (*THIS BEARING IS KEEPING THE COVER FROM BEING PULLED OFF, AS IT WEDGES UNDER A LARGE GEAR ON THE UPPER GEAR CLUSTER*), MUST BE KNOCKED OFF THE END OF THE LOWER SHAFT USING A LARGE FLAT-BLADE SCREW-DRIVER OR A CHISEL. ONCE THE BEARING IS OFF THE SHAFT, IT WILL STAY IN IT'S "POCKET" IN THE TRANSMISSION CASING. **VERY IMPORTANT:** BEFORE YOU START WHACKING THE BEARING OFF THE SHAFT, YOU MUST INSERT A WEDGE OF SOME SORT IN THE GAP YOU HAVE OPENED UP BETWEEN THE TRANSMISSION HOUSING AND THE PTO COVER. OTHERWISE, HITTING ON THE BEARING WILL PULL THE PTO COVER BACK ONTO THE TRANNY, AS THE SHAFT & COVER ARE HELD TOGETHER BY A SNAP-RING.

10. ONCE THE COVER IS FREE, SIMPLY PULL IT OFF. THE UPPER AND LOWER SHAFTS WILL COME OUT WITH THE COVER. WITHOUT THE LOWER SHAFT TO SUPPORT IT, THE LOWER GEAR CLUSTER WILL REST ON THE BOTTOM OF THE TRANSMISSION HOUSING. IT CAN BE LEFT THERE UNTIL RE-ASSEMBLY, UNLESS IT NEEDS TO BE REMOVED FOR SERVICING.

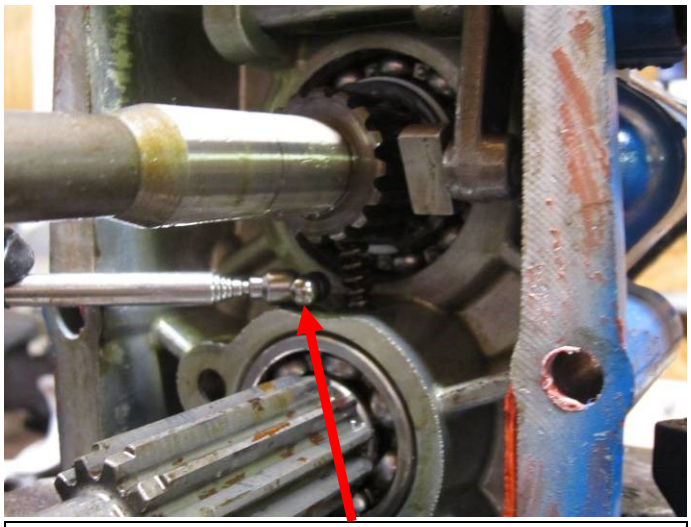
11. TO REMOVE ANY COMPONENTS FROM THE PTO COVER, FIRST RE-MOVE THE REVERSER SPUR GEAR ASSEMBLY (HELD IN PLACE BY TWO BOLTS, 17MM HEADS) THESE ARE VERY TIGHT, AND MAY HAVE BEEN INSTALLED WITH THREAD-LOCKER COMPOUND, SO YOU MAY HAVE TO HOLD THE COVER IN A VISE OR SOME-THING TO HOLD IT STILL SO YOU CAN GET THE BOLTS OUT. (IF YOU PUT IT IN A VISE, MAKE SURE NOT TO DAM-AGE THE GASKET SURFACE)

12. REMOVING REVERSER SPUR GEAR ASSEMBLY. NOTE THAT IT HAS A LOCATION PIN TO CENTER IT UP IN THE HOUSING, WHICH HAS TO BE PROPERLY FIT-TED INTO ITS HOLE UPON RE-ASSEMBLY.

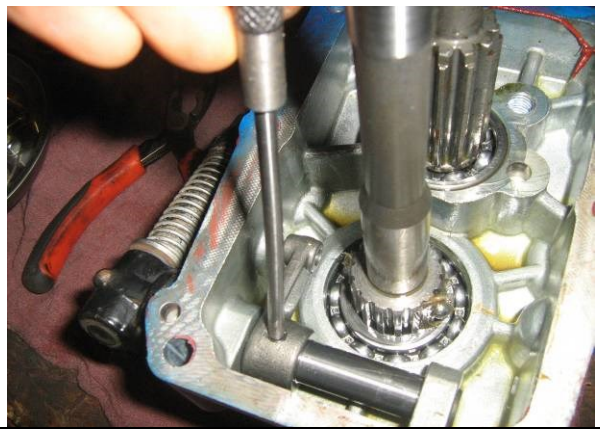
13. THE LARGE PTO DRIVE GEAR CAN THEN BE REMOVED. (NOTE HOW IT COMES OFF...YOU CAN PUT IT BACK ON UPSIDE-DOWN IF YOU'RE NOT PAYING ATTENTION!! **WILL NOT WORK!!)**



14. BY PUSHING THE PTO ENGAGEMENT LEVER, YOU CAN NOW "POP" THE PTO SLIDER GEAR OFF THE LOWER SHAFT. **NOTE:** IT'S BEST TO DRAPE A RAG OVER THE HOUSING BEFORE DOING THIS, BECAUSE THE 'DETENT BALLS" CAN GO FLYING WHEN THIS GEAR IS POPPED OFF...THE RAG KEEPS YOU FROM LOSING THEM!

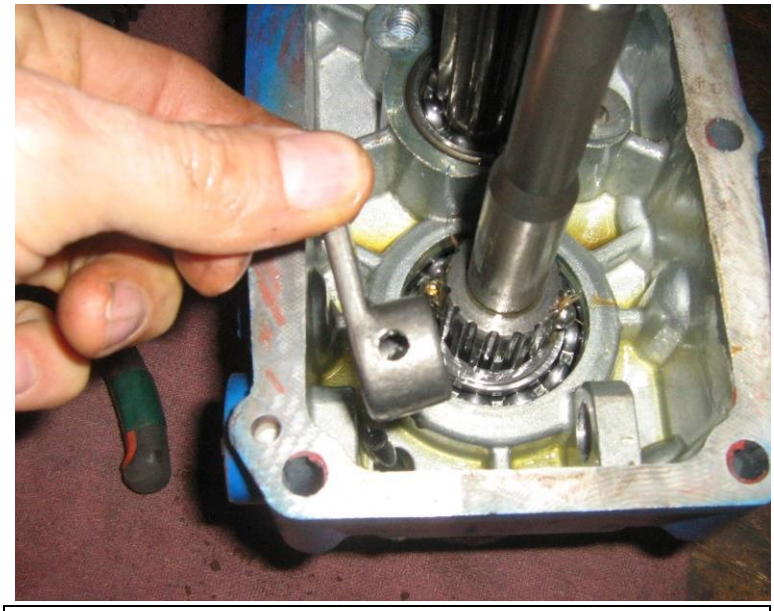


15. RETRIVEING PTO BALL WITH A MAGNET (THERE ARE **2**). NOTE PTO TENSION SPRING JUST TO RIGHT, WHICH HAS FALLEN OUT OF SHAFT IN PICTURE. SPRING NORMALLY GOES THROUGH HOLE IN CENTER OF SHAFT, AND HAS A BALL AT EACH END TO PUSH OUT AGAINST PTO SLIDER, TO MAKE IT "CLICK" INTO POSTION WHEN SHIFTED.

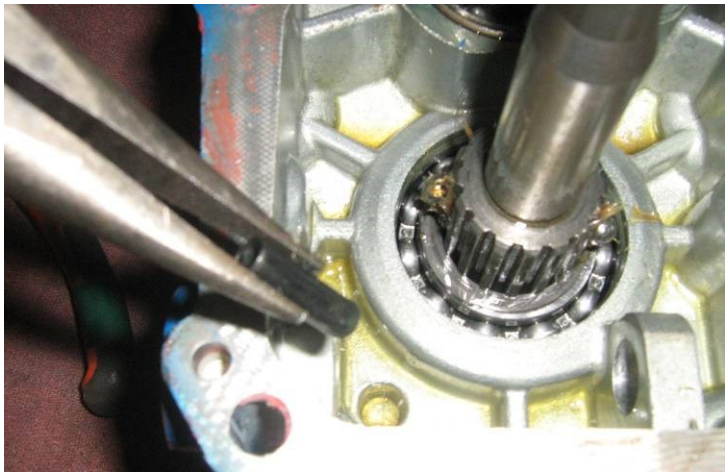


16. USING A 3/16" PUNCH, DRIVE OUT THE ROLL PIN THAT SECURES THE INTERNAL SHIFT LEVER TO THE EXTERNAL LEVER. THERE IS A "POCKET" CAST INTO THE HOUSING TO ALLOW YOU TO DRIVE IT OUT.

17. REMOVE THE EXTERNAL SHIFTER LEVER. YOU MAY HAVE TO ROTATE IT BACK AND FORTH TO SLIP IT OUT OF THE INTERNAL LEVER IF IT'S A TIGHT FIT.

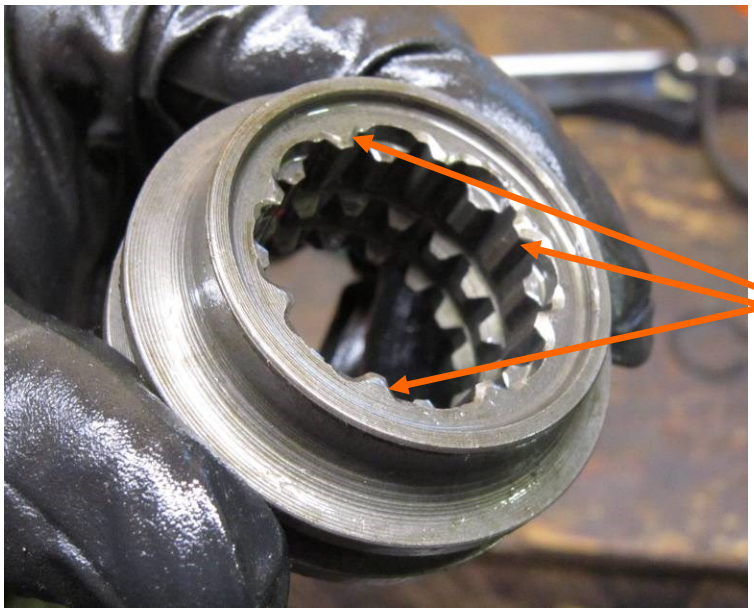


18. REMOVE INTERNAL PTO SHIFT LEVER...TAKE CARE NOT TO MISPLACE THE LITTLE SHIFTING “SHOE” THAT WAS PLUGGED INTO THE END AND RIDES IN THE GROOVE IN THE PTO SLIDER.

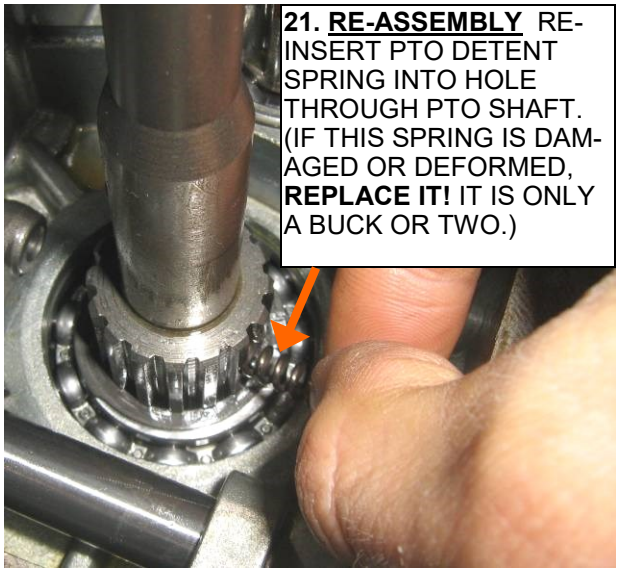


19. RETRIEVE THE ROLL PIN FROM THE LITTLE POCKET IN THE HOUSING. NOTE: IF TRANSMISSION COMPONENTS OTHER THAN THE PTO ENGAGEMENT SYSTEM ARE NEEDING REPAIR, OTHER INTERNAL TRANNY PARTS CAN EASILY BE DISASSEMBLED FROM THIS POINT WITH NO SPECIAL “TRICKS”.

 # 21 BELOW BEGINS RE-ASSEMBLY OF PTO AND FINAL ASSEMBLY OF TRANSMISSION.

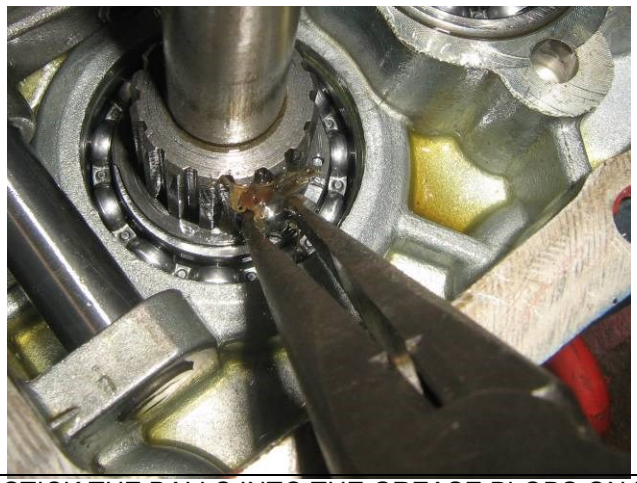


20. CLOSE-UP OF PTO SLIDER. THIS ENGAGES WITH THE REAR CENTER-COG OF THE LARGE PTO GEAR TO POWER THE IMPLEMENTS. IF PTO IS ENGAGED WITHOUT USING THE CLUTCH, THE IMPACT THE SLIDER (WHICH IS STATIONARY WHEN THE PTO IS DISENGAGED) SLAMMING INTO THE PTO GEAR (WHICH IS ROTATING AT UP TO 1000 RPM), WILL SEVERELY DAMAGE THE TEETH ON BOTH COMPONENTS (ONLY A FEW TEETH POINTED OUT, FOR CLARITY…[ACTUALLY, THE TEETH IN THIS PICTURE ARE FINE]) BY “ROUNDING” THEM DOWN. AS A RESULT, THE PTO WILL KEEP POPPING OUT OF GEAR BECAUSE THE DRIVING SURFACES ARE NO LONGER FLAT AND THE “ROUNDED” TEETH SIMPLY WANT TO PUSH AWAY FROM EACH OTHER WHEN POWER IS ENGAGED TO THEM...THE HIGHER THE POWER REQUIREMENTS OF THE IMPLEMENT, THE MORE IT WILL WANT TO DISENGAGE WHEN THESE TEETH ARE DAMAGED. **SQUEEZE THE CLUTCH BEFORE SHIFTING GEARS** AND YOU WILL NEVER HAVE THIS PROBLEM!! **NOTE: The PTO gear and slider and pictured in this document is the “older style” used from 1995 to approx. 2014. The newer machines have similar components, but the “male” and “female” aspects of the mating teeth are REVERSED.**

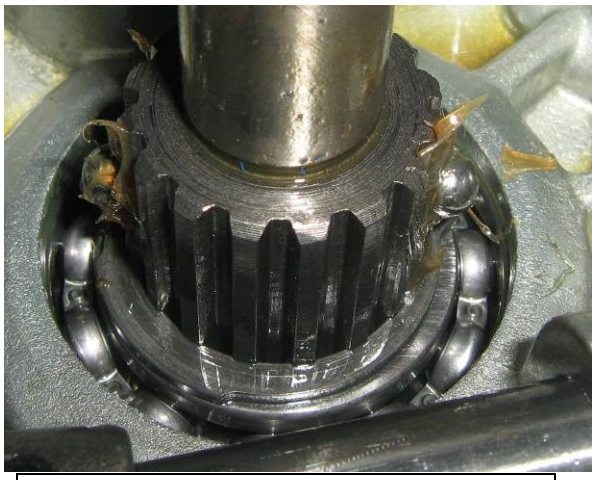


21. RE-ASSEMBLY RE-INSERT PTO DETENT SPRING INTO HOLE THROUGH PTO SHAFT. (IF THIS SPRING IS DAMAGED OR DEFORMED, **REPLACE IT!** IT IS ONLY A BUCK OR TWO.)

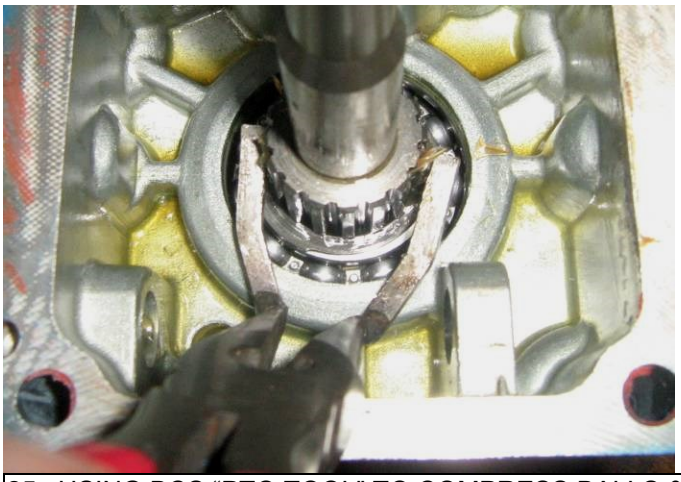
22. APPLY A DAB OF THICK GREASE TO EACH END OF THE HOLE THAT NOW HAS THE SPRING IN IT. (A SMALL BRUSH IS BEING USED TO APPLY THE GREASE IN THIS PICTURE) THIS GREASE WILL HELP HOLD THE BALLS IN PLACE FOR RE-ASSEMBLY



23. STICK THE BALLS INTO THE GREASE BLOBS ON EITHER END OF SPRING HOLE. (HOLE IN THE PLOT: THE INTERNAL PTO SHIFT LEVER IS STILL IN PLACE IN A FEW OF THESE PICS...BAD PHOTO SEQUENCING ON OUR PART, PLEASE IGNORE. RE-ASSEMBLY IS EASIER WITH LEVER **OUT** OF HOUSING.)



24. BALLS STUCK IN GREASE ON EITHER SIDE OF HOLES IN SHAFT; SPRING IS INSIDE SHAFT (BETWEEN BALLS)

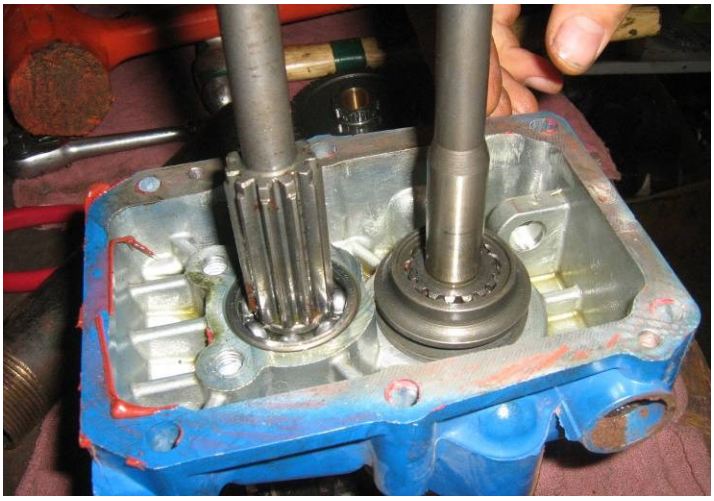


25. USING BCS "PTO TOOL" TO COMPRESS BALLS & SPRING INTO SHAFT BEFORE INSTALLING PTO SLIDER...NOTE POSITIONING OF TOOL. **NOTE:** IT IS BEST TO HAVE THE PTO SHAFT END THAT IS PROTRUDING THROUGH THE COVER CLAMPED IN A VISE FOR THIS PROCEDURE, TO HOLD IT AND THE COVER STILL...THIS PIC WOULD BE LOOKING DOWN.

26. SET PTO SLIDER DOWN OVER PTO SHAFT (MAKE SURE IT IS RIGHT SIDE UP, AS IN PICTURE)...IT WILL REST ON TOP OF PTO TOOL "FINGERS". YOU ARE STILL COMPRESSING PTO TOOL AND HOLDING TIGHT, AND NOT MOVING, OR THE BALLS WILL POP OUT...

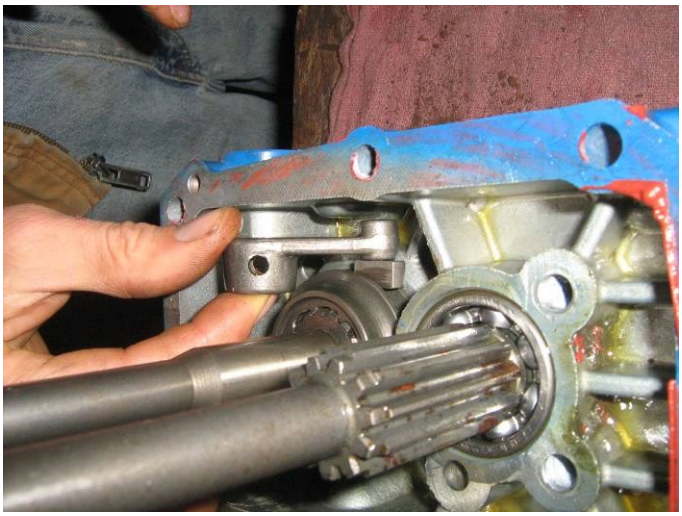
27. TAKE A PIECE OF 1 1/4" STEEL WATER PIPE (10" TO 14" LONG) AND PLACE IT ON TOP OF PTO SLIDER. NOTE DEADBLOW HAMMER TO LEFT...

28. STILL HOLDING TIGHT ON PTO TOOL, SMACK DOWN ON PIPE **HARD** WITH HAMMER. SLIDER WILL SHOVE PTO TOOL FINGERS DOWN OFF BALLS AND BALLS WILL BE TRAPPED INSIDE SLIDER (IF ALL GOES WELL). **INPECT INSIDE OF HOUSING CAREFULLY** TO MAKE SURE A BALL DID NOT "ESCAPE"!! (IF IT DID, MAKE SURE SPRING IS OK, AND REPEAT PROCEDURE UNTIL CORRECT.)



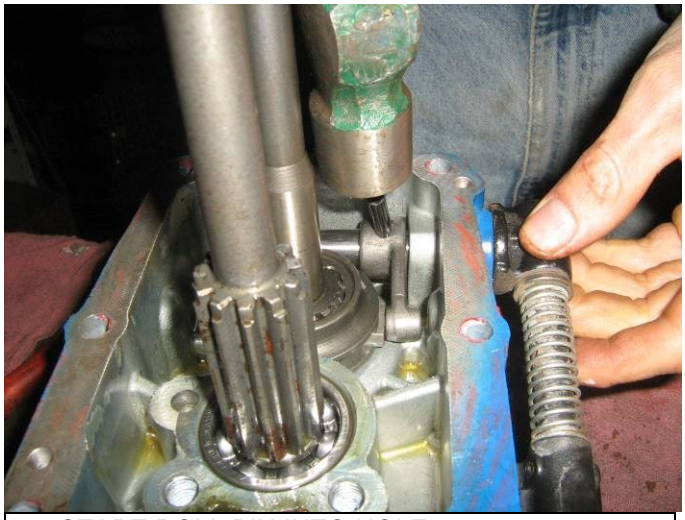
29. PROPERLY INSTALLED PTO SLIDER (AFTER PTO TOOL MANEUVERED OUT FROM UNDER IT)

30. INSERT “SHOE” INTO INTERNAL PTO SHIFT LEVER...MAKE SURE TO GET IT IN CORRECT SIDE!!



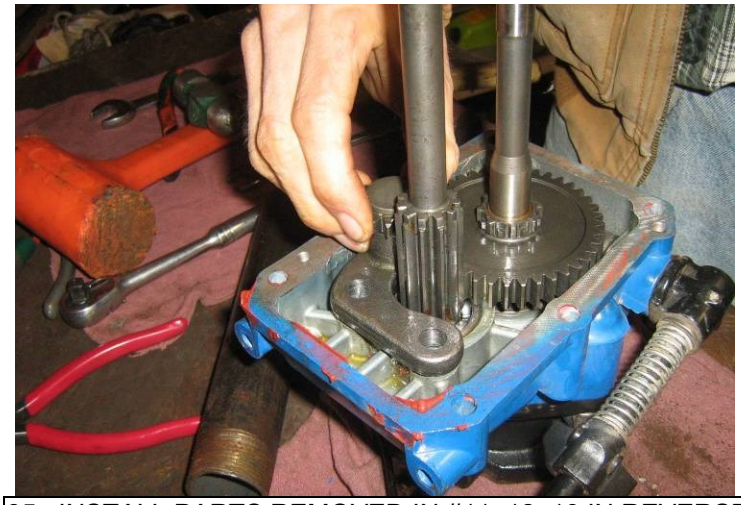
31. SET INTERNAL PTO LEVER DOWN INTO HOUSING, ENGAGING SHOE INTO GROOVE IN SLIDER

32. INSERT OUTER PTO LEVER THROUGH HOLE IN HOUSING, ALIGNING WITH INTERNAL LEVER (**NOTE:** IF YOU HAVE REPLACED THE PTO COVER, **MAKE SURE** YOU HAVE INSTALLED THE LITTLE OIL SEAL IN THE HOLE WHERE THIS LEVER COMES THROUGH THE HOUSING, OR YOU WILL HAVE AN OIL LEAK!!)

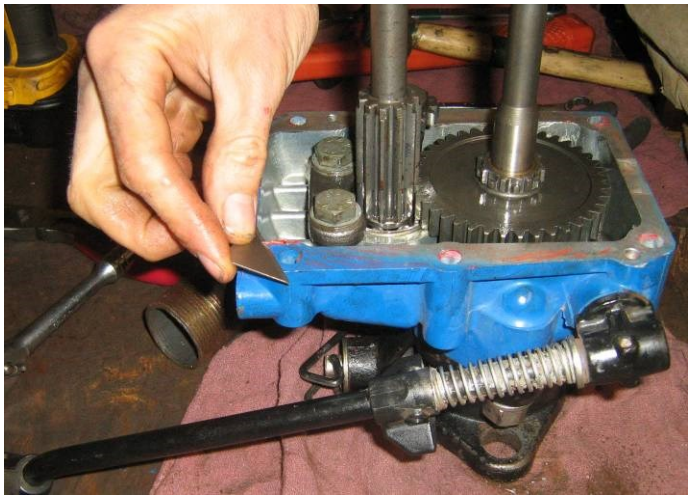


33. START ROLL PIN INTO HOLE...

34. ...AND DRIVE DOWN FLUSH WITH PIN PUNCH AND (STEEL) HAMMER. **MAKE SURE** YOU DON’T ACCIDENTALLY “SHIFT” THE PTO LEVER WHILE THE COVER IS STILL OFF THE TRACTOR...YOU MIGHT POP THE PTO SLIDER OFF THE BALLS, AND HAVE TO DO THAT ALL OVER AGAIN!!

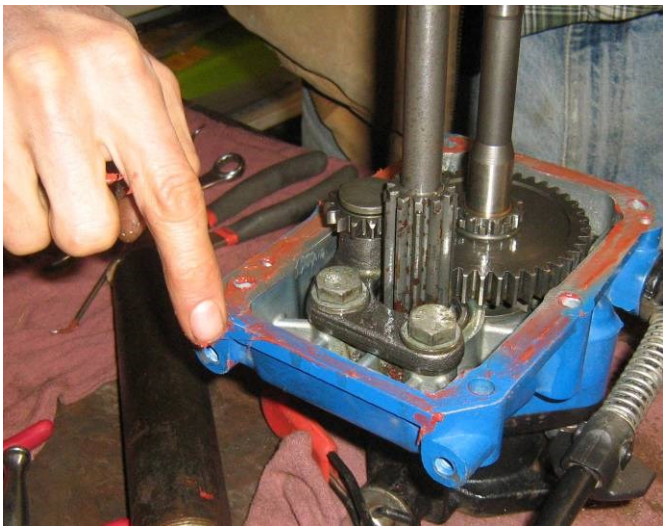


35. INSTALL PARTS REMOVED IN #11, 12, 13 IN REVERSE ORDER. **NOTE:** CENTER COG FACING UPWARD IN PICTURE ENGAGES WITH REVERSER GEAR...MAKE SURE THESE TEETH, AND THE ONES THEY ENGAGE WITH ON REVERSER GEAR, ARE IN GOOD SHAPE. ROUNDED TEETH WILL CAUSE POPPING OUT OF GEAR AND SLIPPING / GRINDING….REPLACE GEARS IF NEEDED.

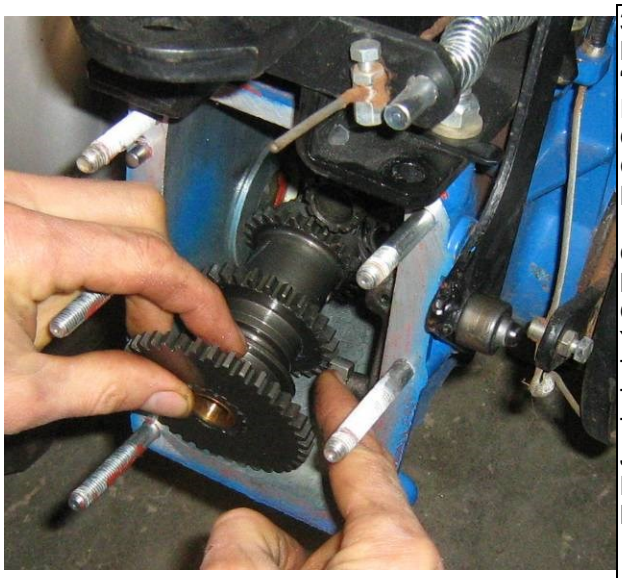


36. USING A RAZOR BLADE, SCRAPE ALL THE OLD SILICONE GASKET SEALER OFF THE COVER, AND THE TRANSMISSION HOUSING. (THIS CAN BE DONE ANYTIME BEFORE NOW, AS WELL)

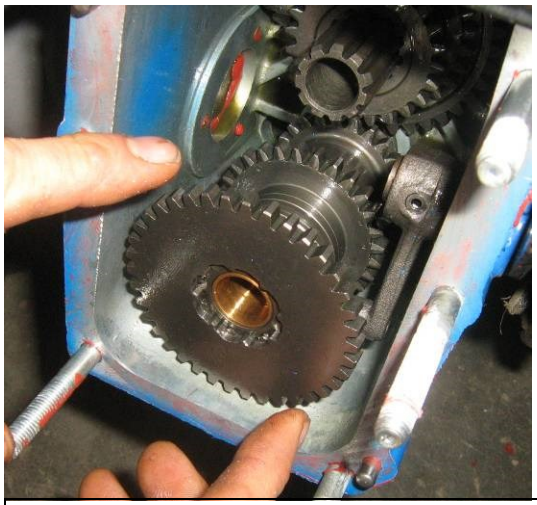
37. USING RED OR BLUE RTV SILICONE GASKET MAKER / SEALER, APPLY A THIN LAYER TO THE GASKET SURFACE. YOU CAN SPREAD IT THIN WITH YOUR FINGER. THIS STUFF IS AVAILABLE AT ANY AUTO PARTS STORE.



38. SPREADING IT AROUND BY FINGER. YOU DON'T NEED LOADS OF THE STUFF ON THERE.

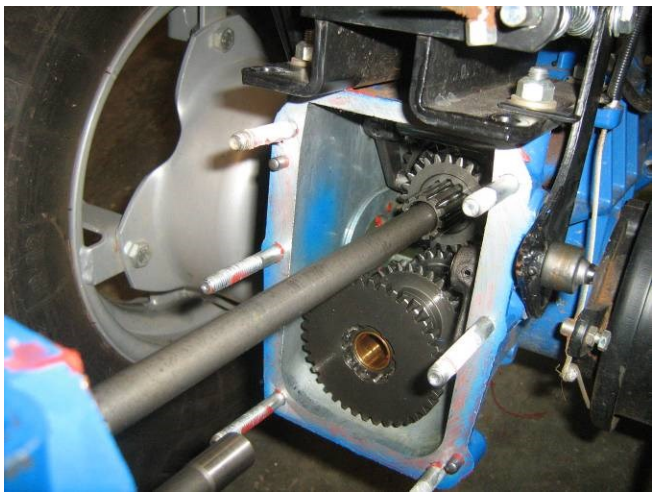


39. MAKE SURE THE REVERSE SHIFTING "SHOE" IS ENGAGED INTO THE GROOVE ON THE REVERSE GEAR (ON THE LOWER GEAR CLUSTER) … MY ONE FINGER IS ON THE SHOE, AND MY OTHER FINGER IS ON THE GROOVE. YOU WILL BE SLIDING THE PTO SHAFT INTO THE LOWER CLUSTER, WHICH WILL BE JUST SITTING ON THE FLOOR OF THE TRANNY.



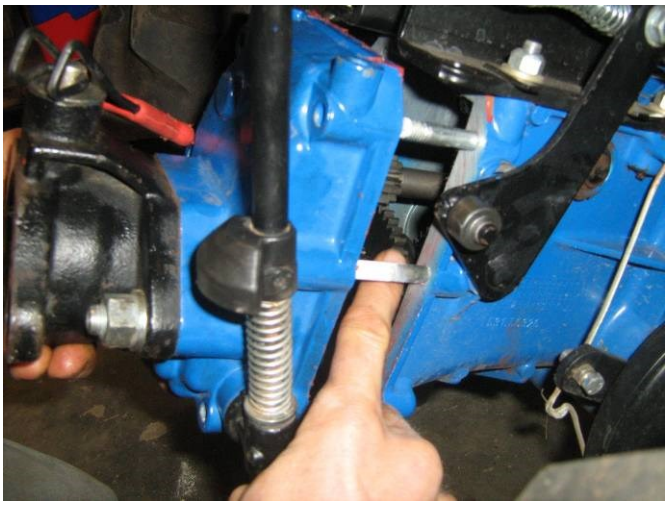
40. LOWER CLUSTER PROPERLY POSITIONED.

41. APPLY A BIT OF GREASE TO FRONT END OF INPUT SHAFT, SO IT WILL NOT DAMAGE FRONT OIL SEAL WHEN SLIDING THROUGH IT.



42. SLIDE PTO COVER ASSEMBLY BACK ONTO TRANNY.

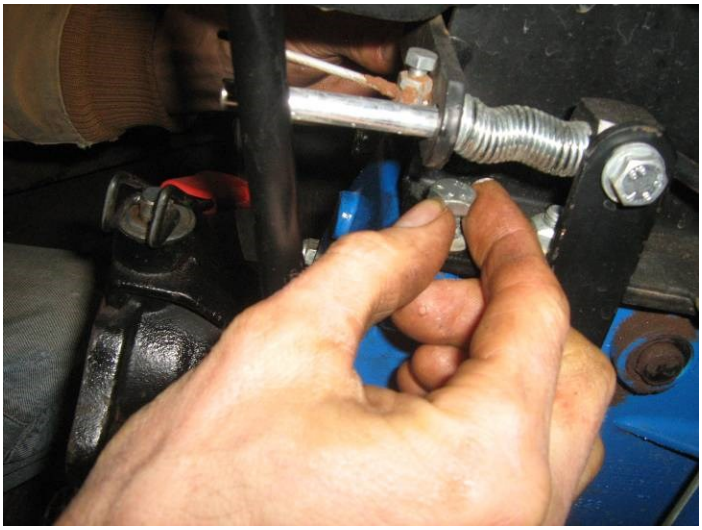
43. MAKE SURE LOWER CLUSTER STAYS IN PLACE AND DOES NOT COME DISENGAGED FROM REVERSE SHIFTING SHOE...



44. ROTATE GEARS A BIT WITH YOUR FINGER (OR A SCREWDRIVER) AS YOU ARE PUSHING COVER ON, TO MAKE SURE EVERYTHING IS LINING UP. CAREFUL NOT TO WIPE THE SILICONE FROM THE GASKET SURFACE...

45. TAP COVER INTO PLACE WITH DEADBLOW OR RUBBER MALLET. YOU SHOULD NOT HAVE TO PUT MUCH FORCE INTO PROPERLY GETTING THE COVER ON….IF IT GOES ON REALLY HARD IN THE LAST BIT...**STOP!** SOMETHING IS NOT LINED UP RIGHT; TAKE IT BACK OFF AND INSPECT, ROTATE GEARS, ETC.

46. RE-INSTALL ALL FASTENERS AND TIGHTEN EVENLY. **DO NOT** USE FASTENERS TO “DRAW” COVER ONTO TRANSMISSION!!!



47. MAKE SURE TO REPLACE THE TWO BOLTS YOU TOOK OUT OF THE TOP...THESE HELP HOLD THE HANDLES ONTO THE TRACTOR!!

48. INSTALL PTO SHIFT ROD, WASHER AND COTTER PIN.

49. LET TRACTOR SIT FOR AT LEAST ONE HOUR SO SILICONE GASKET MAKER CAN SET UP. AFTER MAKING SURE TRANSMISSION OIL DRAIN PLUG IS TIGHT, REMOVE OIL FILLER / DIPSTICK FROM TOP OF TRANNY...

50. ...REFILL TRANNY WITH 90-WEIGHT GEAR OIL (OR EQUIVALENT). TAKES ABOUT 1.5 QUARTS...CHECK LEVEL WITH DIPSTICK, MAKING SURE TRACTOR IS **LEVEL** WITH GROUND FOR PROPER READING...OIL SHOULD BE NO HIGHER THAN TOP LINE ON DIPSTICK.

51. TRANNY DIPSTICK PROPERLY REPLACED.

52. **BACK TO WORK!!** LET THE TRACTOR IDLE A MINUTE OR TWO AND TEST THE ALL THE GEARS TO MAKE SURE EVERYTHING WORKS OK. CHANGE THE TRANNY GEAR OIL AFTER 10 HOURS OR SO, TO FLUSH OUT ANY IMPURITIES YOU MIGHT HAVE GOTTEN IN THERE.

GOOD JOB!!